Oceanic Responses to Wind Forcing As Observed by Satellite Sensors and Diagnosed by Ocean General Circulation Models

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Ocean affects global climate change by the transportation and the storage of heat, fresh water, and greenhouse gases. In the annual and interannual time scales, ocean is largely forced by wind. Observations of wind vector over most part of the ocean are sparse, but the undersampling problem could be alleviated by the observations of the spaceborne microwave scatterometer. Daily fields of wind vectors, from January 1992 to April 1993, were produced by objective analysis from ERS 1 scatterometer data. They were used to force a primitive equation ocean general circulation model. The sea surface temperature and sea level produced by the model were compared with observations by the operational Advanced Very High Resolution Radiometer (AVHRR) and the altimeter on Topex/Poseidon. Sea surface temperature and sea level are the surface signatures of oceanic responses which could be observed by spaceborne sensors over global scales. Reasonable agreements were found in the seasonal cycle over most part of the ocean and the El Nino anomalies in the tropical Pacific. The comparison also revealed the deficiences both in satellite observations and the model physics. This study demonstrates the synergistic application of complementary spaceborne sensors to study global changes. The plan for Earth Observing System includes deployment of a scatterometer with improved coverage, a state-of-the-art altimeter, and MODIS which is a much improved version of AVHRR. Together with other sensors from which the thermal and hydrologic forcing could be derived, our understanding of oceanic responses to atmospheric forcing would be much enhanced,